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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/803,502	03/17/2004	Brian Kevin Paul	245-68071-01	5691

24197 7590 06/06/2008

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EXAMINER	
D'ANIELLO, NICHOLAS P	
ART UNIT	PAPER NUMBER
1793	
MAIL DATE	DELIVERY MODE
06/06/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/803,502	PAUL ET AL.	
	Examiner	Art Unit	
	Nicholas P. D'Aniello	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 April 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-45* is/are pending in the application.

4a) Of the above claim(s) *28-30* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-27 and 31-45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/11/2005 & 10/07/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I, claims 1-27 and 31-45 in the reply filed on April 15th 2008 is acknowledged. The traversal is on the ground(s) that the method and apparatus should be examined together because they are comprehensive in scope. This is not found persuasive because the different classifications and statuary categories of inventions (product and process of making) would cause a serious burden on the examiner because, as claimed, the product could be made by a variety of different methods materially different then the inventive method of Group I. Therefore, the search for the product, although overlapping in part, would be much broader and would therefore cause a serious burden on the examiner if the restriction requirement was not made.

The requirement is still deemed proper and is therefore made FINAL.

Double Patenting

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422

F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

3. Claims 1-27 and 31-45 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-44 of U.S. Patent No. 6,672,502 in view of Paul et al. "Intermetallic Microlaminations for High-Temperature Microreactors". The claims of the instant application differ from the claims of patented application in calling for the lamina to be intermetallic. However, it would have been obvious to provide intermetallic lamina when forming an intermetallic structure because Paul et al. teach a method of making intermetallic microlaminations for microreactors and the desirability to use intermetallic foils to avoid the problem of volumetric shrinkage associated the liquid phase that occurs when employing non-intermetallic foils (page 4 of provided document).

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 2, 4, 14, 15, 23, 28, 31, 32, 39, 40, 43 and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Paul et al. "Intermetallic Microlaminations for High-Temperature Microreactors" (publication provided in IDS).

Regarding claim 1, Paul et al. teach a method of making a structure, which is at least partially intermetallic, by providing a lamina blank, laser ablating (machining) the lamina blank to form a patterned (machined) lamina, stacking and registering the lamina with at least another lamina that may be patterned or non-patterned (figure 2) using a fixture with alignment pins to constrain the lamina at the edges and finally diffusion bonding (processing) the registered stack to make an intermetallic structure (page 9 of the provided document).

In regard to **claims 2 and 4**, Paul et al. teach that the lamina is a Ni_3Al nickel aluminide (page 9).

Regarding **claim 14**, as noted above, Paul et al. teach the lamina is machined by laser ablation (page 9).

As to **claim 15**, as noted above, Paul et al. teach that a patterned lamina is made from a blank lamina procured from Dr. Toshiyuki Hirano at the NIMR of Japan (page 9).

With respect to **claim 23**, Paul et al. teach that the laminae are registered by tack bonding with an adhesive material (page 8, 2.1 Device Design and Fabrication).

In regard to **claim 28**, Paul et al. teach the intermetallic device made by this method.

Regarding **independent claim 31**, Paul et al. teach a method of making an intermetallic structure by providing a plurality of stacked and registered lamina (figure 2) and diffusion bonding the lamina in a vacuum hot press (heat processing) to form a monolithic structure comprising an intermetallic (page 9).

As to **claims 32 and 39**, Paul et al. teach that the stacked and registered laminae include at least one lamina that has been pattered by laser ablation (page 9; figure 2).

Per **claims 40 and 43**, Paul et al. teach the lamina are nickel aluminide and are used to form a binary NiAl intermetallic micro-channel (page 8 and 9).

With respect to **claim 45**, Paul et al. teach a plurality intermetallic laminae (foils) formed in a stack (figure 2).

6. Claims 31-37, 39-40, 43-45 are rejected under 35 U.S.C. 102(b) as being anticipated by Paul et al. "Intermetallic Microlaminations for High-Temperature Microreactors" (published version, hereinafter "Paul 2").

Regarding **independent claim 31**, Paul 2 teach a method of making an intermetallic structure by providing a plurality of stacked and registered lamina (figure 1) and diffusion bonding the lamina in a vacuum hot press (heat processing) to form a monolithic structure comprising an intermetallic (page 239).

As to **claims 32-36 and 39**, Paul 2 teach that the stacked and registered laminae include multiple metal layers (first and second) where many (first and second) of the lamina have been pattered by laser ablation prior to heat processing (page 238; figure 1).

As to **claim 37**, Paul 2 teach that the laminae are registered by fixturing pins (connected by a post) (page 239)

Per **claim 40**, Paul 2 teach the laminae formed are nickel aluminide (page 238).

In regard to **claim 43-44**, Paul 2 teach that the laminae are nickel and aluminum (metal foils) (page 238).

With respect to **claim 45**, Paul 2 teach a plurality intermetallic laminae (foils) formed in a stack (figure 1).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Paul et al. "Intermetallic Microlaminations for High-Temperature Microreactors" in view of de Nova et al. (USP 6,338,785).

Paul et al. teach the intermetallic laminations as applied to the claims above. **Claim 3** differs from the reference in calling for the nickel aluminide to be NiAl. However, it would have been obvious to use a NiAl in the microreactors of Paul et al. because de Nova et al. teach the use of both NiAl and Ni_3Al for high temperature applications; NiAl being especially preferred because of its high temperature resistance and good mechanical characteristics (column 4, lines 53-58).

10. Claims 5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paul et al. "Intermetallic Microlaminations for High-Temperature Microreactors" in view of Rawers et al. (USP 5,564,620).

Paul et al. teach the intermetallic laminations as applied to the claims above. **Claims 5 and 8** differs from the reference in calling for the intermetallic to be iron aluminide or titanium aluminide. However, it would have been obvious in the art to form the microreactors of Paul et al. from any suitable intermetallic such as iron aluminide or titanium aluminide because Rawers et al. teach the ability to form intermetallic sheets of Fe-Al, Ni-Al or Ti-Al interchangeably (column 4, Example 1) because their elemental metallic sheets may first be formed into any desired shape (column 3, lines 55-68).

11. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paul et al. "Intermetallic Microlaminations for High-Temperature Microreactors" in view of Rawers et al. (USP 5,564,620) and Maziasz et al. (USP 5,545,373).

Paul et al. and Rawers et al. teach the intermetallic laminations as applied to the claims above. **Claims 6 and 7** differ from the references in calling for FeAl or Fe_3Al, however it would have been obvious to use these specific intermetallics in the microreactors of Paul et al. because Maziasz et al. teach the interchangeable use of iron aluminides such as FeAl, Fe_3Al or $FeAl_2$ because they all exhibit high-temperature corrosion resistance (column 4, lines 19-31).

12. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paul et al. "Intermetallic Microlaminations for High-Temperature Microreactors" in view of Rawers et al. (USP 5,564,620) and Siemers (USP 4,838,337).

Paul et al. and Rawers et al. teach the intermetallic laminations as applied to the claims above. **Claims 6 and 7** differ from the references in calling for TiAl or Ti_3Al however it would have been obvious to use these specific intermetallics in the microreactors of Paul et al. because Siemers teach the formation of titanium aluminides such as TiAl, Ti_3Al or $TiAl_3$ and that TiAl and Ti_3Al can be used at extremely high temperature ranges (column 1, lines 43-54).

13. Claims 11, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paul et al. "Intermetallic Microlaminations for High-Temperature Microreactors" in

view of Duszczyk et al. "The Characteristics of the Diffusion Between the As-reaction-formed Ni3Al Intermetallic Compound and Pure Nickel for Interfacial Bonding".

Paul et al. teach the intermetallic laminations as applied above. **Claims 11 and 12** differ from the reference in calling for a pure nickel bonding lamina (however any of the lamina interposed between two laminae could be considered a bonding lamina as claimed in claim 11) however it would have been obvious to provide a bonding layer or lamina of pure nickel because Duszczyk et al. teach the that pure nickel layers create a well established interface with intermetallic lamina (page 111).

In regard to **claim 13**, although Duszczyk et al. teach a nickel foil thickness which is larger than the claimed thickness, Duszczyk et al. acknowledges that the thickness of the layer is a result effective variable, and therefore it would have been obvious in the art to determine by routine experimentation the thickness which would produce the optimized result for a given application (page 111, column 2).

14. Claims 16-21, 24-27 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paul et al. "Intermetallic Microlaminations for High-Temperature Microreactors" in view of Paul et al. "Intermetallic Microlaminations for High-Temperature Microreactors" (published version, hereinafter "Paul 2").

Paul et al. teach the method of forming intermetallic laminations as applied to the claims above. **Claim 16** differs from the reference in calling for providing a second lamina comprising at least first and second metal layers. However, it would have been obvious in the art to form an intermetallic structure in such a manner because Paul 2

teach a method of forming an intermetallic microreactor by stacking lamina comprising at least first and second metallic layers (figure 2) which are converted to intermetallics (page 239).

As to **claims 17-21**, Paul 2 teach at least three metal foils where two are elemental aluminum and one is elemental nickel (figure 2) which are heated together to form an intermetallic structure (page 239).

In regard to **claim 24**, Paul 2 teach that the laminae are placed in a vacuum oven to form an intermetallic structure (page 239).

In regard to **claim 25**, Paul 2 teach that the aluminum foil is heated to 1000ºC which would naturally result in liquid phase bonding as elemental aluminum melts well below this temperature (~660 ºC) (page 239).

In regard to **claim 26**, Paul et al. teach that the laminae are diffusion bonded together (page 9).

Regarding **claims 27 and 38**, Paul et al. teach that these kinds of MECS devices may be used in micro-channel catalytic reactors (page 3).

15. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Paul et al. "Intermetallic Microlaminations for High-Temperature Microreactors" in view of Paul et al. "Intermetallic Microlaminations for High-Temperature Microreactors" (published version, hereinafter "Paul 2") and Rawers et al. (USP 5,564,620).

Paul et al. and Paul 2 teach the intermetallic laminations as applied to the claims above where two of the metal layers are aluminum. **Claim 22** differs from the reference

in calling for the different foil to be titanium. However, it would have been obvious in the art to form the microreactors of Paul et al. using titanium instead of nickel because Rawers et al. teach the ability to form intermetallic sheets of Ni-Al or Ti-Al interchangeably (column 4, Example 1) because their elemental metallic sheets may first be formed into any desired shape (column 3, lines 55-68).

16. Claims 41 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paul et al. "Intermetallic Microlaminations for High-Temperature Microreactors" (Paul 2) in view of Rawers et al. (USP 5,564,620).

Paul et al. teach the intermetallic laminations as applied to the claims above. **Claims 41 and 42** differs from the reference in calling for the intermetallic to be iron aluminide or titanium aluminide. However, it would have been obvious in the art to form the microreactors of Paul et al. from any suitable intermetallic such as iron aluminide or titanium aluminide because Rawers et al. teach the ability to form intermetallic sheets of Fe-Al, Ni-Al or Ti-Al interchangeably (column 4, Example 1) because their elemental metallic sheets may first be formed into any desired shape (column 3, lines 55-68).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicholas P. D'Aniello whose telephone number is (571)270-3635. The examiner can normally be reached on Monday through Thursday from 8am to 5pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on (571) 272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

NPD
6/3/08

/Jerry A Lorengo/
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